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A NOTE ON COMPRESSED TABLETS.

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Considerable has, at various times, been written on the subject of compressed tablets, their history and development up to the present-day method of manufacture. The various excipients and diluents, such as sugar, starch, etc., used at various times in their manufacture, have also been dealt with in detail. This paper, therefore, is only intended to add a few more facts that have come out in the course of some investigations made by the writer.

Recently, in doing some work on commercial compressed tablets and tablet triturates, it was found that at the present time white dextrin is the most generally used diluent and disintegrator, both for compressed tablets and tablet triturates.

White dextrin is of very variable quality. Different samples of it differ widely as to degree of conversion; some reduce Fehling's solution readily, while others hardly affect it at all, and between the two extremes one can get almost any degree of reduction of Fehling's solution with different samples.

White dextrin appears to be well fitted as a disintegrator and lubricant for insoluble material. It causes rapid disintegration of a compressed tablet, provided it is used in sufficient quantity and a careful working method is adopted. Some substances require more, others less dextrin to bring about an immediate disintegration. Thus, for instance, commercial tablets of acetyl salicylic acid contain only 30 per cent. of dextrin, while those of the basic bismuth salts and of salol contain between 40 and 50 per cent. of it.

The immediate breaking up of a tablet on contact with water does not, however, mean that such a tablet is fit for solution and consequent ready assimilation. The adhesive substance used in granulating the material is a factor of no small importance. Indeed, the complete disintegration of a tablet depends largely upon it. For instance, if gelatine or glue is used in granulating, such tablets re-

quire two or three hours in water before the individual granules absorb sufficient water to become softened.

A tablet, therefore, prepared from material granulated with gelatine, is not what, on superficial observation, it looks to be; for, while it does break up readily into granules, these in turn do not soften rapidly, and consequently ready disintegration and solution of the medicinal substance is out of the question.

Furthermore, it seems some manufacturers have gotten into a rather routine method of manufacturing compressed tablets, the same excipient being used for all kinds of material. It certainly is not good practice to use dextrin in the making up of tablets of soluble material. A readily soluble salt like sodium salicylate does not need a disintegrator at all. In fact, in such tablets dextrin does more harm than good, because, on contact with water, it forms a thick starch paste, enveloping the soluble substance in such a way as to prevent ready solution.

Such tablets require from two to three hours for solution, while the same kind of tablets prepared without dextrin are completely dissolved in fifteen to twenty minutes' time.

To sum up, then, it is safe to say that, while dextrin is a good and valuable disintegrator in the manufacture of compressed tablets, it should not be used indiscriminately, and when it is used it should be done with intelligence, otherwise more harm than good will be the result to the patient, whose welfare should always be kept in mind.

THE CUTTING OF MICRO-SECTIONS.

By H. H. Crosbie, Baltimore.

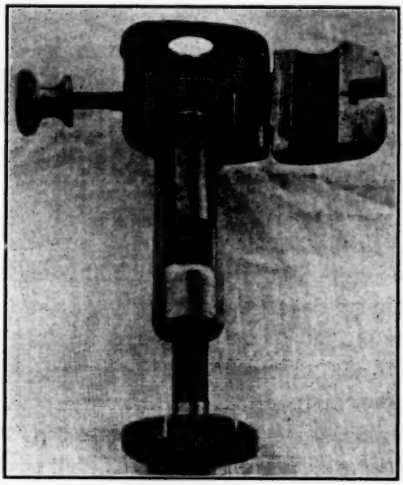
In the commercial laboratory where time is an important factor the cutting of sections is usually done by hand, an operation calling for considerable skill and patience. The microtome of commerce is usually to be found resting in desuetude on a top shelf, hand cutting being found to be easier and quicker.

The instrument illustrated has been devised and has been in use for some time, and we find it entirely replaces the skilled hand cutting previously in use. As an instance, one is able to cut a satisfactory cross-section of a henbane leaf through a vein, as thin as 0.05 millimetre, with only a few minutes' preliminary soaking in warm water.

The microtome consists of a brass body hinged to open down

the central orifice, which is 10 millimetres in diameter and is fitted with a plunger actuated by a micrometer screw, the top against which the cutting is done being fitted with a hard steel surface.

In use a half cylinder of supporting material is placed in each side of the body and the hinge closed with the specimen between; it is then clamped with a swing bolt.



A new hand microtome.

In the case of a leaf or a delicate bark the best supporting material is found to be ivory soap; with thicker bark or roots elder pith is preferable, while cork is resorted to only when very refractory material is encountered. An ordinary razor is used to make the sections, using a drawing cut and pressing the razor firmly against the steel plate. The micrometer screw is fed forward between each cut by an amount determined by trial, but rarely less than 0.002 inch.

SOME STUDIES ON THE OXY-PINENES.

By J. Emile Blomén, A.M., Ph.D.

Historical.

In the *Medical Record* of February 13, 1915 (also this Journal, April, 1915), appears an article by Dr. Bertram H. Waters relating to the use of ozonide of pinene vapors in the treatment of pulmonary diseases. As very little is to be found in ordinary text-boks in

regard to ozonides in general and ozonide of pinene in particular, I thought it would be of interest to see what the periodical literature accessible in the New York Public Library contained in this line, and, in the hope that the investigation might interest others as it did me, I herewith submit the result of the research.

The first thing that impressed me was that the very vapor of ozonide of pinene which Dr. Waters says he used was known as early as 1865.

By his many contributions to the *Comptes rendus . . . de l'Académie des Sciences* from 1854 J. L. Soret added considerably to our knowledge of ozone, and in one of his articles (*Compt. rend.*, 1865, p. 41) he states that he has found that oil of turpentine was able to absorb ozone in its molecular form, *i.e.*, as O_3, and without decomposing it in any way.

Cornelius B. Fox, in his work on "Ozone and Antozone," London, 1873, refers to this work of Soret in the following words: "He has discovered that, whereas most substances only remove the third atom of oxygen from ozone, oil of turpentine is capable of absorbing the whole molecule. If 92 cubic inches of ozonized oxygen are treated with oil of turpentine instead of with mercury, *a white cloud is produced,* and the residual oxygen is found to occupy a volume of only 76 cubic inches."

This was undoubtedly the first discovery and description of ozonized oil of turpentine, or rather ozonide of pinene, and is the very same vapor which Dr. Waters describes in his article.

In his seven ways of producing ozone Fox further states: "By the slow oxidation from exposure to light and air of certain ethers, volatile and resin oils and other bodies, which have been denominated "ozone carriers," such as . . . oil of turpentine . . . cinnamon . . . the blood-corpuscles, etc., these bodies are said to absorb ozone without combining with it, and to possess the property of yielding it up to other substances. . . . Some have said that these essential oils . . . do not betray the presence of ozone, but of peroxide of hydrogen."

A most significant statement, in the light of our present knowledge of the matter!

Previous to this, however, in the *Lancet,* February 3, 1866, Dr. Day, of Geelong, advocated the use of these "ozone carriers" for sanitary purposes. He recommends that "shirts, blankets, bedclothing and bandages of the sick" be sprinkled with an ether which had undergone this process of ozonization.

Although its medical properties were not recognized or rather mentioned, ozonide of pinene was well known to chemists more than ten years before Dr. Day's recommendation of them. So, for instance, does Leopold Gmelin, in his standard work, "Handbook of Chemistry," London, 1850, vol. 14, p. 256, state: "Oil of turpentine absorbs oxygen gas, acquiring new properties, and being converted into ozonized oil of turpentine. In this compound part of the absorbed oxygen appears to be more intimately, a second part less intimately, combined, inasmuch as the latter may be transferred to new bodies and still exhibit the properties of free oxygen."

This is in perfect accordance with our modern conception of pinene ozonide, which is that, in contact with water, only so much oxygen is given up to the formation of peroxide of hydrogen as is not required to form pinene aldehyde and pinene aldehyde-peroxide.

A little later, or 1857, William Allen Miller, in his text-book "Elements of Chemistry," vol. 3, "Organic Chemistry," says: "Oil of turpentine absorbs oxygen from the air with formation of certain proportions of ozone."

Chas. T. Kingzett, in the *Journal of the Chemical Society*, London, 1874, vol. 12, p. 511, takes up these assertions and tries to disprove them. He claims that what really happens when oil of turpentine absorbs oxygen from the air—which fact he admits—is the formation of monohydrated oxide of turpentine ($C_{10}H_{16}O.H_2O$).

Hardly a year later, in the same journal, vol. 13, p. 210, he retracts this view and considers the oxidation product of oil of turpentine to be $C_{10}H_{16}O_4$, which when boiled with water forms peroxide of hydrogen.

This almost exactly coincides with the formula of some oxy-pinene which has recently been examined by the author and found to have the empirical formula $C_{10}H_{16}O_{4-5}$. This oxy-pinene is unquestionably a mixture of pinene ozonide and the aldehyde and ketones of pinene, whereas pinonic acid can easily be proved to be absent.

The nature of ozone was in dispute for more than twenty years after its discovery by Schoenbein. On one side it was said that it was "electrified oxygen," on the other that it could not be formed except in presence of water, and that it therefore must be an oxy-compound of hydrogen.

In his remarkable prize-essay, June, 1861 (printed in *Boston Medical and Surgical Journal*, September, 1864), Dr. E. S. Gaillard

gives this subject a thorough airing. He quotes both sides and comes to the conclusion that ozone can be formed only in the presence of moisture. He considers ozone and peroxide of hydrogen identical, and often uses the expression " peroxide of hydrogen or ozone."

He gives a very graphic description of the poisonous nature of ozone, and then he describes some beneficial actions which can be ascribed only to peroxide of hydrogen. He also states that ozone " unites rapidly with metals, *if they are wet* "—a very clear thing to us who know the tendency of moisture to transform ozonides into peroxide of hydrogen in presence of a third substance.

He is familiar with the fact that oil of turpentine transforms the atmospheric oxygen to ozone, and ascribes to this property the beneficial effect pine forests have in malarial cases.

He describes different ways in which " ozonized oil of turpentine " may be prepared, and with our present knowledge there can be no doubt that it is the ozone and not the peroxide of hydrogen which he refers to. He cites cases in which the administration of this ozonized oil has been beneficial in cystitis, gout, rheumatism, vesical catarrh, hæmaturia, and many other vesical disorders.

Speaking of the use of an ozonized oil of turpentine in pulmonary diseases, he cites Dr. Theophilus Thompson, physician to the Hospital for Consumptives, London, and gives a number of definite cases which have been successfully treated with ozonized oil. He corroborates this with quotations from others, and at last draws the conclusion that: " The administration of ozonized oils has a most remarkable tendency to reduce the frequency of the pulse, in addition to producing a decided improvement in the general health and condition in consumptive patients."

In the Annual Report of the Board of Regents of the Smithsonian Institution for 1864 (p. 174) Charles M. Wetherill tells us: " One of the best ozone carriers known is the oil of turpentine. If a bottle be one-quarter filled with this body, exposed to the sun and frequently shaken with air, removing the stopper from time to time to renew the air, the oil is speedily laden with ozone." Further down he says that " all turpentine kept with access of air becomes ozonized," and ends up by stating (p. 178): " From what is known at present respecting 'antozone' (peroxide of hydrogen) it would seem that this body plays an important part in depriving the atmosphere of ozone." This is no surprise to us, who now know that ozonides in contact with moisture easily form peroxide of hydrogen.

John S. Townsend, in the *Proceedings of the Cambridge Philosophical Society,* January 13, 1899 (vol. 10, p. 5), says: "The *cloud* which is formed when ozone is bubbled through turpentine differs on some points from those which are described above (potassium iodide vapors). It can be shown . . . that the cloud is due to the action of ozone on turpentine vapor. . . . In the case of the cloud formed with turpentine its intensity is not diminished to any marked extent by bubbling through sulphuric acid; so that we see that the main constituent is turpentine."

This seems to prove that the vapor which Dr. Waters uses was known not only to Townsend, but to the general scientific world at that time, and is identical with the one described by Soret thirty-four years previously.

If we adopt the definition given in most text-books and dictionaries, that "peroxide is that oxide of a given base which contains the greatest quantity or an unusual amount of oxygen," then we can hardly speak of a peroxide of a hydrocarbon, and decidedly not in the case of pinene, as nobody yet has been able to set the limit to the amount of oxygen which can be absorbed by oil of turpentine.

If, again, we mean with an organic peroxide such as oxy-compound which forms metallic peroxides, then this difficulty of distinguishing between peroxide and ozonide is quite explainable, for the ozonide has also the power of forming metallic peroxides.

This uncertainty regarding the nature of oxy-pinene was really not quite cleared up until Dr. Harries and his disciples began their splendid investigations of the ozonides, to which I will refer later on.

In concluding this little historical sketch of the literature on ozonides of turpentine, which is to be found in the New York Public Library, I will quote from an article by Dr. Debierre, which appeared in the *American Meteorological Journal,* April, 1887 (vol. 3, p. 575): "Schoenbein, in 1850, proposed the use of ozonized oil of turpentine for pulmonary diseases. Seitz employed this preparation of turpentine with success, it is said, in chronic catarrh of the urinary organs, and even in hæmaturia and incontinence of urine. Thompson employed ozone and fatty oils in phthisis with good results, probably due to the oil."

As will be seen, the ozonide of pinene has been known for a long time, and there is not the least doubt that as the chemistry and nature of the oxy-pinenes in general will be better understood their therapeutic use will vastly increase.

The Oxidation-Process, Chemistry and Bibliography of the Oxy-pinenes.

When man awakened to the fact that Nature itself provided remedies for his ills, his attention undoubtedly was first turned to turpentine and its oxidation products. Turpentine, this wonderful, aromatic exudation from the pine forests in which he lived, and its still more wonderful oxidations, varying in consistency from a light, amber-colored syrup to a hard rosin, could not help but attract his attention.

This fact can be verified in our days, for in the northern part of the Scandinavian peninsula, as well as in the pine districts of this country, the first thing that inhabitants and lumber workers turn to in their illness is the friendly pine-exudations.

It is not to be wondered at, therefore, that as far as the history of materia medica and therapeutics goes back we will find the name of "Terebinthina" mentioned and its properties discussed.

And this is proper, for nowhere in Nature can be found a more marvellous "dead" organic substance than this one which, like a living being, inhales oxygen from the air and, transforming it, gives it off in another form.

Nevertheless, the process by which this takes place and the nature and chemistry of the changes are almost as great a mystery in this age of science as it was at the time of the cave-dwellers.

I have above given a short history of the oxy-pinenes; it will be my endeavor now to show the chemical processes which take place when pinene absorbs and gives off oxygen in its different forms in a natural way, without entering upon the possible derivations of the oxy-pinenes, on which volumes already have been written and many more could be written.

In this connection it should be stated that no distinction can be made between the oxygen-carrying property of pure pinene and turpentine, because it has been established time and again that the reason that the latter is an oxygen carrier is entirely due to the presence of its principal constituent, pinene.

It will be sufficient to quote one authority on this point: C. Engler and J. Weissberg (*Ber.*, vol. 31) prove, by very exhaustive and extensive parallel experiments, "that the oxygen-carrying property of turpentine is not due to impurities, but solely to the presence of pinene."

One of the authors, C. Engler, two years later (*Ber.*, vol. 33), oxidizes turpentine by oxygen in the presence of indigo-sulphuric acid solution containing acetic acid, and finds "that half of the total oxygen at first absorbed is 'active' and is subsequently used for oxidizing other substances or for intermolecular oxidation." This rather perplexing experience will be quite clear when viewed in the light shed on the subject by Professor Harries and his disciples.

In the year 1840 the eminent German chemist, Schoenbein, found that oxygen, like sulphur, phosphorus, carbon, etc., could exist in different allotropic modifications; that ordinarily the oxygen molecule was composed of two atoms of oxygen (O_2), but that under some conditions it also could form molecules containing three atoms of oxygen (O_3), and this allotropic modification of oxygen he called ozone.

This modification of oxygen naturally was very "active" on account of its instability, and easily gave off its third atom of oxygen in the form of nascent or atomic oxygen.

The usual chemical combination between oxygen and hydrogen, water (H_2O), possesses only a very feeble oxidizing power, but in the year 1818 Thenard discovered that oxygen and hydrogen could be combined in the proportion H_2O_2 (hydrogen peroxide), and in this state the oxygen became very active indeed, readily combining and forming peroxides with anything with which it came into contact.

No wonder these two substances were confused—particularly as the "peroxide of hydrogen is produced whenever ozone is found in the presence of water" (E. Molinari, "Treatise on General and Industrial Chemistry," London, 1913), and that there was considerable doubt about when the active oxygen appeared in the form of ozone or that of hydrogen peroxide. This was, as has before been pointed out, particularly the case with the oxygen-carrying turpentine.

How little was really known about the oxidation of turpentine at so recent a date as 1898 may be judged from an article in *Rev. de Chim. Ind.* (vol. 9) of that year by R. Robine. In this he says that the only known way to oxidize turpentine "consists in exposing the ordinary oil to the action of the air until a sufficient degree of oxidation has taken place." He admits, however, that the process may be hastened by "forcing air through the oil under predetermined conditions of temperature and pressure." He describes the product obtained as "a syrupy liquid with the color of honey and soluble in

alcohol, ether, and chloroform," and in general does his description of this oxidation product of turpentine tally exactly with the one Harries definitely identified as ozonide of pinene.

That the oxidizing of turpentine by ozone was not entirely unknown by this time seems to appear from the discussion of a paper read by Colonel W. J. Engeldue to the Society of Chemical Industry on December 5, 1898, in which Mr. W. F. Reid remarks: " For ages turpentine has been used as an oxygen-carrier, and it is not surprising, therefore, that it was now found to be a useful carrier for ozone "; and: " When ozone passed through turpentine white vapors were given off of an intensely active character." Here again we meet the white vapors described by Dr. Bertram H. Waters.

After Schoenbein had discovered ozone he began the study of the absorption of oxygen by turpentine from the atmosphere, and has given the result of his investigations in a series of articles (*Journ. pr. Ch.*, vols. 52, 53, 54, 66, and 67; *Ann.*, vol. 102, and *Jahr.*, 1851, 1859, and 1860), in which he advances the theory that the oxygen is transformed by the turpentine to ozone, and ascribes its chemical properties to this fact.

This theory is hotly contended by a number of chemists, such as Berthelot (*Jahr.*, 1859, and *C.-B.*, 1861) and Houzeau (*Jahr.*, 1860), who claim that oxygen can be absorbed by turpentine only in the presence of water, and then forms a peroxide of pinene. This view is supported by Kingzett (*Journ. of Chem. Soc.*, vol. 27; *Pharm. Journ., Ber.*, 3, vols. 5, 6, 9, and 20; *Ber.*, vol. 29, and *Jahr.*, 1876), who tries to prove that the oxidation takes place by the turpentine first forming peroxide of camphene and then peroxide of hydrogen and oxy-pinene according to the reaction $C_{10}H_{16}O_4 + 2H_2O = H_2O_2 + C_{10}H_{16}O_4$.

Closely allied to this point of view are the opinions of Bradsky (*C.-B.*, 1882), Schaer (*Ber.*, vol. 6), and Papasogli (*Jahr.*, 1876, and *C.-B.*, 1888). They all fail, however, to explain why—if this is the case—the oxy-pinene formed gives reactions which the peroxide of hydrogen does not; for instance, liberates iodine from potassium iodide.

In order to explain away this troublesome fact another hypothesis was advocated by Engler and Wild (*Ber.*, vol. 30), Engler and Weissburg (*Ber.*, vol. 31), Engler (*Ber.*, vol. 33), Engler and Frankenstein (*Ber.*, 34), and particularly in a monograph by Engler and Weissburg, " Uber die Auto-oxidation."

According to this supposition auto-oxidation takes place by direct addition of a molecule of oxygen to the pinene $C_{10}H_{16}\begin{matrix}O\\|\\O\end{matrix}$.

It has already been referred to how Engler and his helpers tried to use this hypothesis in explaining the oxidation phenomena of pinene, but were baffled by the different absorption of " active " and ordinary oxygen at different temperatures.

That ozone and peroxide of hydrogen could not exist together was definitely proved by Schoenbein as early as 1879, who showed that in that case the reaction $O_3 + H_2O_2 = H_2O + 2O_2$ necessarily must take place (*Ann.*, vol. 196). H. Schiff, in two exceptionally thorough articles (*Ber.*, vol. 16, and *Chem. Zeit.*, vol. 20), has set beyond all doubt that by air oxidation of turpentine an aldehyde of pinene is formed, but he is in doubt if to give it the formula $C_{10}H_{16}O_3$ or $C_{10}H_{16}O_4$. He also proves that the property of turpentine to absorb oxygen and give it off again to other substances has nothing whatever to do with the presence of water.

Although ozone had been known as a powerful oxidizer ever since its discovery, 1840, there is very little mentioned about it in scientific literature in this connection—at least as a direct oxidizer. Adolphe Renard, in 1895, produced what he called ozo-benzol (*Compt. rend.*, vol. 120) from direct action of ozone on benzol, and this undoubtedly was a true ozonide, but it attracted no attention at the time.

Instead of following this clue to what an ozonide is, a bitter controversy arose—as has been previously stated—over the question of in what form " active " oxygen existed on oxy-pinenes—some holding stubbornly to the theory that it was there as ozone, and others with equal tenacity maintaining that it could exist only in the form of a peroxide.

It was only after Dr. Karl Harries, professor of chemistry at the University of Kiel, took up the investigation that the question was satisfactorily and definitely settled, and to him and his disciples and followers is due the greatest credit for our present knowledge of the ozonides and the oxy-pinenes.

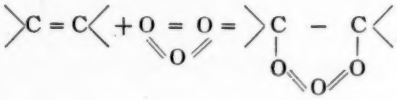
Already in 1903, in an article in *Berichte der deutschen chemischen Gesellschaft* (vol. 36, 2, p. 1933), Harries begins a series of researches on the oxidation of ozone. In this article he only calls attention to the fact that alcohols oxidized by ozone form aldehydes; so, for instance, does methyl alcohol, when oxidized by ozone, form formaldehyde in water solutions.

In the same year P. Fenaroli and E. Molinari each published accounts of oxidation by ozone, but without giving the decomposition products, in *Annuario della Societa Chimica de Milano.* The real, systematic investigation of the ozonides, however, was begun a year later, when Harries described the preparation of ozonides in two different ways (*Ber.*, vol. 37, 1).

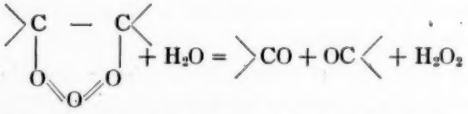
The first method is to let the ozone act directly on the substance without any solvent and in the cold—the temperature is kept low and moisture excluded by a current of carbon dioxide—and the second to act on the substance to be oxidized in a solution in presence of water.

He finds that in the first case peroxide of hydrogen is not formed, whereas in the second case it is invariably formed. In the same volume of the *Berichte* are two articles by Harries and A. S. Oza and Harries and Richard Weil, which fully establish that the ozone molecule enters into the combination with different hydrocarbons and fatty acids of the oleic series by direct addition, and are entirely distinct chemical compounds, with a different linking from any other.

In an exhaustive article published in Liebig's *Annalen der Chemie,* entitled "Ueber die Einwirkung des Ozons auf organische Verbindungen," 1907, (vol. 343, pp. 311–374), Harries gives a full account of his work on the ozonides. He is now able to state that the ozonides in general are "heavy oils or water-glass like, almost colorless liquids of more or less explosive character," and that their formation takes place in the following way:



and that when they come into contact with water they are decomposed into aldehydes or ketones and peroxide of hydrogen in the following manner:



In this dissertation, "Zur Kentniss der Dialdehyde und Ketoaldehyde," Kiel, 1905, Hans Tuerk takes advantage of this fact pointed out by Harries, and proves its correctness by preparing a large number of aldehydes direct from the ozonides.

Harries's results are strongly contested by E. Molinari, E. Soucini and P. Fenaroli in *Annuario della Societa Chimica di Milano, Berichte,* and in other places, but Walter Frank, in his dissertation "Ueber Oelensauerozonid und seine Zersetzungsprodukte," Hamburg, 1910, in comparing the two different opinions, comes to the conclusion that the reason for their ostensibly contradictory results lies in the strength of ozone used and the method of production, and in his text-book, "Treatise on General Industrial Organic Chemistry," 1913, Molinari says that "the decomposition of ozonides with dilute alkali or hot water results in the formation of acids and in the cold of aldehydes. . . ."

In 1908 Harries gives an account (*Ber.*, vol. 41, 1) of the ozonization of pinene. He obtains two different ozonides in the same mixture, viz., one solid and one liquid. The solid, which amounts to 10 to 20 per cent. of the total, consists of "small, elastic clusters of undefined crystallinic form," and this he calls pinene perozonide. He is unable to get a definite formula for it, and can only say that it is nearer $C_{10}H_{16}O_4$ than $C_{10}H_{16}O_3$, and is insoluble in all the usual organic solvents.

The oily ozonide 80 to 90 per cent. of the yield, on the other hand, has the definite formula of $C_{10}H_{16}O_3$. The decomposition products he finds to be peroxide of hydrogen, and at ordinary temperature the intermediary oxy-pinenes, *i.e.*, aldehydes and ketones, and, by heating or by prolonged intermolecular or auto-oxidation, pinonic acid.

In 1909 W. J. Knox devised and patented an apparatus for the production of vapors of pinene ozonide. The apparatus consists of a tank partly filled with pure pinene, over which a current of air, dried by being drawn through chloride of calcium, is passed, evaporating and carrying pinene vapors along to a mixing chamber, where it is met by a current of ozone generated by silent electrical discharges in an ozonizing tube. When the pinene vapor and the ozone meet they form ozonide of pinene, which appears in the form of a thick, whitish vapor or cloud.

An examination of this vapor by the test-papers ordinarily used for such purposes will show that no free ozone exists, nor any peroxide of hydrogen, but if the test-paper is moistened a peroxide of hydrogen reaction will immediately take place.

If the vapor is compressed in an ordinary air compressor and then allowed to strike against a cold surface, such as the bottom of a glass beaker, clusters of ill-defined crystals can be detected by a

magnifying glass. The vapor will be invisible when escaping from the compressor, but will soon again be visible carried around by the air currents.

This vapor seems without doubt to be the " perozonide of pinene " described by Harries, and, by his investigation and the author's own experiments, it can be positively stated that its decomposition products at ordinary temperature on contact with moist surfaces are peroxide of hydrogen and the intermediary oxy-pinene, *i.e.*, aldehydes and perhaps ketones of pinene.

To sum up our present knowledge of oxy-pinene, then, it may be stated:

1. When pinene or turpentine is oxidized by the air, ozone is absorbed from the air, either in the form of ozone, or the ordinary oxygen is, partly at least, transformed into ozone.

2. When pinene is directly oxidized by ozone one or more ozonides of pinene will result.

3. When either of the above ozonides of pinene comes into contact with moisture a decomposition will take place, resulting in the formation of peroxide of hydrogen and the intermediary oxygen compounds of pinene (oxy-pinenes).

4. On prolonged standing or by heat intermolecular or auto-oxidation will take place, resulting in the higher oxidation products of pinene—pinonic acid, etc.

How these properties of the oxy-pinenes have unconsciously been taken advantage of during the course of centuries for therapeutical purposes is a matter of considerable interest, and the history of the therapeutical use of oxy-pinenes is a subject the author hopes he will be allowed to come back to in the near future.

232 Schermerhorn Street,
Brooklyn, N. Y.,
March 30, 1915.

REMARKS ON DIGITALIS.[1]

By William C. Alpers, Sc.D.

It is generally stated in text-books and also in the United States and other pharmacopœias that the digitalis leaves of the second year's growth are preferable to those of other years, and that the

[1] Abstract of paper read before the Pharmaceutical Section of the Cleveland Academy of Medicine, January 29, 1915.

cultivated ones are inferior to the wild ones. Recent observations do not seem to support this statement. F. H. Carr, in the AMERICAN JOURNAL OF PHARMACY, states that the first and second year's growths have proved identical in their activity, and the cultivated leaves are at least as active as those wild grown. Hatcher, who in his "Text-book of Materia Medica," by Hatcher and Sollmann, indorses the preference of the second year's growth, has since, in a recent article (*Drug. Circ.*, 1914), claimed equal value for first and second year's leaves, as well as for cultivated leaves in comparison with wild ones. Lloyd's observations also confirm this view, and he attributes the erroneous statement about the second year to the fact that formerly also the root was used, which in the first year is insignificant and sappy, while the second year's root is larger and heavier and more pronounced in quality. There may be another reason, however, for adhering so long to the second year's leaves as better. The statement in the text-books is followed by the other one, "gathered at the commencement of flowering." Now, digitalis does not flower till the second year, and leaves could not be gathered in the first year at the commencement of flowering. As the flowers were also used formerly, and are used to-day in Japan, it can be understood how the statement of the second year's growth originated, flowers and leaves being gathered at the same time. According to the best investigators, this statement should therefore be changed to "leaves of the first or second year's growth should be used."

Professor Hivohashi, of the University of Tokio, Japan, who made extensive investigations in digitalis, states (*Apoth. Zg.*, 1913, vol. 28, p. 9) that digitalis *flowers* probably contain more of the active constituents than do the leaves, and the buds are more active than are the expanded flowers.

As to the preservation of the gathered leaves, all kinds of more or less complicated directions are given in the various pharmacopœias. According to recent literature, however, foxglove leaves do not differ materially from most other vegetable drugs; that is, they will deteriorate if kept carelessly, and keep almost indefinitely if properly stored in air-tight containers in dark places. The changes that do undoubtedly happen take place in the time between gathering and marketing, according to the manner in which the drying is done.

There are four pharmaceutical preparations of digitalis official in our pharmacopœia, viz.: The extract, the fluidextract, the tincture, and the infusion, of which the first one is but rarely and

the second one not often used. According to all authorities, the tincture and infusion are the two most reliable preparations, but there is a vast difference of opinion as to the relative value of the two. Herzfeld states that:

"I believe that in this country the tincture is the least reliable of all preparations of digitalis, particularly since, for the sake of convenience, it is frequently prepared by diluting the fluidextract, which in itself may be inferior."

Other authorities also dwell on the improper preparation of tinctures from fluidextracts. It is well worth while to stop a minute to investigate this charge. I myself have in former years, when physicians made this remark, asked them how many pharmacists, to their positive knowledge, made their tinctures from fluidextracts. Generally the answer was: "Well, of course, I do not know, but conclude, from the fact that sometimes tinctures do not produce the desired effect, that they are made improperly." And when I replied: "Doctor, are you sure that in such cases you always ordered the right medicine?" the answer would be: "Of course I did; I diagnosed the case myself." In other words, whenever the patient does not respond to the treatment the fault lies with the pharmacist, but not with the physician. The unbiased observer will say, if men are apt to make mistakes there will be as many mistakes made by physicians in diagnosing as by pharmacists in dispensing. I personally do not believe that the practice of making tincture from fluidextract is general; it may prevail among lazy and indifferent druggists, who hardly have any prescription trade for this very reason.

Coming back to our subject, there is besides Doctor Herzfeld no other authority to reject the tincture. As a rule, the tincture is preferred to the infusion, so far as reliability is concerned, and whenever the full cardiac effect of digitalis is required. As a diuretic, in cases of faulty circulation of blood through the kidneys, the infusion is preferred by probably 95 per cent. of all practitioners. An exception is Doctor R. A. Hatcher, who in a recent paper states that:

"As a matter of fact, a properly-made infusion, as well as the tincture, contains all of the therapeutic active principles of digitalis."

He tries to prove this statement by saying that the marc left after making the tincture is inert, and if an infusion be made with this marc and tested on a frog, the truth of this statement becomes

apparent. It is to be regretted that he did not also examine the marc left after making the infusion. Later on, in the same article, he says:

"An infusion from a fluidextract might be unsightly, but it would probably be more active than the official infusion which one would obtain from the nearest pharmacy. This practice is distinctly not advocated, but pharmacists should understand the fact."

We ask: Why not advocate it if it makes a better infusion? And if the tincture and infusion are of equal value, why not make the infusion from the tincture, or why not delete one or the other?

In direct contradiction to Hatcher's results we will cite Herzfeld:

"According to the methods of Keller-Fromme, no digitoxin or digitalin could be detected in an infusion prepared according to the U. S. P., while in an infusion, made after my method, as high as 0.02086 per cent. digitoxin could be found."

Doctor Herzfeld's method is as follows: The leaves are finely broken up and freed from the stems and ribs. They are then covered with the entire quantity of boiling water and allowed to digest upon the water-bath at 50° C. for one hour. When cooled down to about 32° C. an amount of alcohol corresponding to 10 per cent. of the finished infusion is added and the whole permitted to stand for 12 hours. The resulting product is then filtered, the leaves expressed, and the necessary amount of water added to restore the volume. Later on he says that this "infusion" (it is rather a weak tincture) should always be prepared fresh. This would compel the patient to wait about 14 hours for his medicine, a rather long wait for cardiac patients.

In an editorial of the *American Druggist,* 1913, vol. 16, p. 12, the statement is made that:

"According to Henry Beates, not one physician in ten can tell the difference in the effect produced by an infusion of digitalis made from a fluidextract and that produced by one made from the assayed leaf."

This may be interpreted that physicians are not able to tell the effect of their medicine, or that Doctor Hatcher's statement of infusions made from fluidextract is correct.

As to the reliability of the fluidextract itself, we quote J. D. Riedel:

"Fluidextract of digitalis U. S. P. VIII was found to vary in

specific gravity from 0.945 to 0.991, and in extract content from 10.30 to 17.41 per cent."

And Puckner (*Jour. Amer. Med. Assn.*, 1913) claims:

"Examination of 20 samples of fluidextract of digitalis confirmed the generally-held belief that commercial digitalis preparations vary most widely. The most active were found to be nearly four times as active as the weakest."

Against this statement protests were afterwards printed in a number of pharmaceutical publications.

In the coming pharmacopœia the formula for the infusion of digitalis will remain the same while the alcohol in the tincture will be increased to 60 per cent. and the fluidextract to 70 per cent. It is claimed that this large amount of alcohol is necessary to preserve the preparation.

I regret that the formula for the infusion will remain unchanged. It is now made with boiling water and 10 per cent. of alcohol is added after straining. For what purpose is the alcohol added? The properly-prepared infusion without alcohol will keep long enough to be taken, and for a longer preservation the amount of alcohol is inadequate. The alcohol should be omitted and the remark:

"To be freshly prepared, when wanted"

added to the formula. As it stands now, the presence of alcohol misleads many thoughtless pharmacists to think that the infusion may be kept in stock.

Prolonged medication with tincture of digitalis often produces nausea and other untoward effects. It is stated that a certain fat or fixed oil present in the leaves is the cause. As this substance is soluble in petroleum benzin, the leaves can be freed from it by subjecting them to the action of benzin before making the tincture. The general verdict of the medical profession is in favor of this fat-free tincture, although Hatcher and others deny its preference.

According to Hatcher's experiment, isolated fat from digitalis proved harmless. This probably is true, but would be no proof that even a small amount of this fat in the presence of various alkaloids may not influence their action.

As to the source of the best leaves of foxglove not much literature is available. It is stated that the plant grows in England, Middle Europe, and also in America, and here and there the timid state-

ment is made that soil containing iron is best adapted for its growth. According to Gehe (*Handesberichte,* 1913, p. 84):

"Digitalis is found generally on soil containing iron and manganese, and does not occur in Switzerland on this account. It is assumed that manganese is essential for the life of digitalis."

In contradiction of this, Hatcher says:

"Another curious misconception regarding digitalis which is hard to explain is that the leaf grown in certain regions is more active than that grown in other localities."

This is probably the most remarkable statement in Hatcher's excellent paper. Whosoever has paid attention to the development of agricultural chemistry, the introduction and first results of which have made Liebig immortal, would rather say: "It would be hard to explain if the leaf grown in certain regions were not more or less active than that grown in other localities." I do not think that a plant of powerful and characteristic properties is known that does not change its nature nor produce its constituents in a larger or smaller quantity when transplanted to a new soil. Every farmer in France and Germany knows that the same potato planted in a marshy soil will produce a different tuber than when planted in a sandy soil. Grape-vines brought from the Rhine or Garonne to California will flower and bring fruit, but the grape differs in flavor and amount of alcohol produced. The same vine even differs in different parts of California. Many European aromatic flowers, like chamomile, mullein, and others, grow abundantly in America, but lack the ingredients that make them valuable; and they even differ in aromatic properties in different parts of the home country. Why should digitalis be an exception to this general rule? Doctor Thoms, of the Pharmaceutical Institute of Berlin, one of the best and most careful pharmacologists living, states in the last volume of the *Arbeiten aus dem Pharmazeutischen Institut,* 1914, p. 202, speaking of the difficulties of cultivating certain medicinal plants:

"How important, for instance, it would be to have digitalis, which in different parts of Germany is subject to such extraordinary variations in respect to its active principles, under proper scientific cultivation and discover the conditions which for the growth and production of the active principles of digitalis are most favorable."

The chemistry of digitalis is still more confused than its pharmacy, and so far every new assayer has discovered—or claims to

have discovered—new principles of various nature. The number of so-called active constituents of the plant is growing daily. Merck & Co., in their annual report of 1911, mention 92 different articles, with their discoverers and properties, and the number has been increased considerably since then. Many of these are identical, and a good many are mentioned only in the papers published by their authors, but were never isolated or brought in the market. Among these many names four stand out prominently, namely, digitalin, digitonin, digitoxin, and digitalein.

The oldest one of these, digitalin-Nativelle, was isolated by the French chemist Nativelle, who claimed it to be a pure substance, while Schmiedeberg, who made an extensive examination of the plant, pronounces Nativelle's digitalin a mixture of several substances, and gave the name digitalin to another chemically uniform, amorphous body for which he presented a formula. Another digitalin was isolated by Kiliani, another by Homolle-Quevenne, another by Lancelot, another by Lebourdais, and so on. In Merck's list the name of digitalin appears 37 times, each time denoting a different article. No wonder that a confusion prevails and that prescribers and dispensers are at a loss what is meant by digitalin. It is not the object of this paper to enter into the merits of these numerous glucosides for each of which the discoverer or manufacturer claims a certain superiority over others. But in view of these different results obtained by men of great learning, long experience, and renowned ability, we are led to the question if there is not a reason for this disagreement and if perhaps some fundamental facts or principles have been overlooked.

Now, in trying to bring the various results into some classification, we notice that nearly all agree on the fact that some of the products are soluble in water, some insoluble in water but soluble in alcohol. Kiliani states that digitoxin is insoluble in water, Hatcher makes the same statement, while Cloetta separated a soluble digitoxin, to which the name of digalen was given. It is further stated that, while digitoxin is insoluble in water, it becomes soluble in water, best in hot water, in the presence of a certain saponin that is also present and which, according to some authorities, is identical with digitalein, according to others with digitonin. The presence of a saponin is also claimed by a number of other investigators, but by no means by all. It is on this basis that Hatcher makes the claim that the infusion contains all the active ingredients of digitalis held in solution by

saponin. He therefore supposes that no change takes place when the infusion cools, although every druggist knows that a slight precipitate forms, and he also must suppose that this saponin and the insoluble digitoxin are present always in the right proportion,—that is, enough saponin to dissolve the digitoxin. As a matter of fact, however, the presence of saponin is still in doubt, and even those who claim its presence do not agree on the quantity, some speaking of a trace only. But nearly all investigators agree on the instability of the various digitalis preparations and the ease with which the one is changed into the other. Some doubt the presence of any preëxisting digitoxin in the plant, believing that it forms, after the leaves are gathered, through the influence of this saponin. We are reminded of bitter almonds, where the amygdalin, through the action of a ferment, is changed into benzaldehyde, hydrocyanic acid and glucose. Might there not be a similar cause in digitalis that would account for the evasiveness of the various chemicals? It cannot be doubted that a soil containing iron and manganese is most favorable to the development of the plant, and, if the claim that manganese is necessary for the production of digitoxin is correct, what hinders us to suspect a certain relationship between manganese and this complex body? To the adherer of the infallibility of the theory of elements such a thought may appear like the outgrowth of a disordered imagination. But other apparently impossible theories have been proved to be founded on facts, and a chemical genius may come some day and upset many of our pet theories. The inadequacy of the chemistry of digitalis should certainly lead the investigators to consider the plant as a harmonious total, and not take out its chemistry as a part that can be studied and understood without reference to its whole life and development and productions.

It would be wrong to write a review of digitalis without mentioning the physiological tests to which this plant has been subjected in the last two decades. Here the same confusion reigns as in its chemistry. Naturally so. How can we successfully test a chemical before we have absolute knowledge of its properties? Frogs, mice, rabbits, dogs, cats, have been used to establish what is called a standard. But no two investigators agree. These physiological tests are beyond the scope of the pharmacist and physician, as they require especially-arranged biological laboratories that cannot be established without considerable expense. In the same way the physiological chemist requires special training and long experience.

Consequently these laboratories are, as a rule, constructed by large manufacturing houses who employ the best talent that they can find. It is natural that these men work in the interest of the firm that employs them and that their researches always confirm the superiority of the preparation that their employers prepare. This is no adverse criticism of their activity. The commercial houses that go to the expense of establishing and maintaining such laboratories try, without doubt, to produce the best articles in every line, and as each and every digitalis preparation has some advantages and characteristics of its own, it is but natural that these advantages are exploited in preference to others. But science gains but little by these efforts, and the skepticism that many entertain in reference to biological tests is justified. This became evident some years ago in New York, when the representatives of a large German manufacturing house undertook a crusade against the sins of certain druggists, as stated, in reality, however, to push and advertise a certain proprietary article. Numerous prescriptions were written by their physicians and then analyzed by chemists of repute, and incidentally a result was obtained that was not looked for. Among the prescriptions were a number for tincture of digitalis. The dispensed articles were sent to a biologist of good name, who conducted the physiological laboratory of a manufacturing house. He tested them *secundum artem,* without prejudice, and his report was published. It now happened that some of the samples had come from his own house, had been tested by him, and a certificate as to the strength had been attached to the containers. In his report he declared some of these same tinctures worthless, others too strong. Guaranteed assayed tinctures from other firms shared the same fate. No greater discredit could have been thrown on biological assaying by its worst enemy than by these careful, conscientious examinations. When they were introduced into the pharmacopœia it was stated that they were needed on account of the inadequacy of the chemical test; but, far from solving the problem, they have only added to the confusion and uncertainty.

Before closing I wish to refer again to Thoms' *Arbeiten aus dem Pharmazeutischen Institut.* On page 204 L. Rosenthaler is quoted as follows:

"I am of the opinion that plants produce some of their constituents as a protective weapon against vegetable or animal attacks; but as their enemies do not always have the same geographical

distribution as the plants themselves, these protective principles are not needed where the respective enemies are lacking, and consequently are not produced. This supposition explains the fact that the amount of digitalin of cultivated digitalis is less than that of the wild-grown plants."

This is not a new theory. It has been shown that the cinchona tree produces quinine as a protective against the attacks of certain insects and bacteria, and whenever the tree is transplanted to countries where it is not attacked by these enemies the production of quinine gradually decreases. I also refer to Doctor R. C. Eccles's paper on "Pharmaceutical Bacteriology" in the *Proceedings of the American Pharmaceutical Association,* 1894.

Many other instances of self-protection of plants against surrounding enemies, be they of vegetable or animal nature, or conditions of the atmosphere, could be mentioned. Here, then, is an unexplored field. We generally do not grant self-consciousness and individuality to plant organism, but the few observations that we have made seem to indicate that there is in these low organisms far more foresight and judgment in action than we admit. They may not think, but their work and productions could not be more correct and logical if they had been planned by the most highly developed mind. Nobody ever expects to discover the thoughts of a human being by dissecting his body after death and analyzing the various parts. Can we expect to explore plant life in its conception and its influence on surrounding Nature by dissecting the plant and analyzing what is left after its death?

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SALT AND ITS RELATION TO NUTRITION.[1]

CARNIVORA EAT LITTLE SALT—THE DESIRE OF VEGETARIAN ANIMALS FOR SALT PROBABLY DUE TO EXCESS OF POTASSIUM OVER SODIUM IN THEIR FOOD.

By PERCY G. STILES.

Common salt is a commodity the annual production of which is known to exceed 12,000,000 tons. Of this huge total a large share is used as a preservative or otherwise employed in industry, yet an immense quantity is deliberately added to the diet of mankind. It is said that an individual consumption of 20 grammes a day is not unusual. This average, sustained for a year, would amount to about 17 pounds. The ration appears surprisingly large when we observe that it may be as much as one-quarter of the total weight of protein taken and equal to one-twelfth of the combined starch and sugar which constitute our main dependence for running the human engine.

It is agreed by all writers on the subject of nutrition that only a small part of this salt consumption is necessary. The rest is dictated by appetite; it is due to the common liking for the salty flavor. Individuals are found who do not care for this and who are said to eat no salt. This means that they use none voluntarily at table and perhaps direct that none shall be used in the kitchen. Yet they continue to receive a small salt ration because some is present in most foods and there is reason to believe that this minimal supply cannot be dispensed with. Sodium chloride is the chief salt in the blood and in the other fluids of the body. It is accordingly plain that growth

[1] Reprinted from *Science Conspectus,* vol. 5, No. 1.

cannot be continued unless this compound is furnished along with the other necessary nutrients.

When full stature is reached the need for salt is doubtless diminished. It might cease entirely if it were possible to avoid all loss of salt in the excretions. This possibility is nearly but not quite realized. When a man fasts for several days the escape of sodium chloride from his system sinks to a low level but remains appreciable. It may be in the vicinity of 0.6 gramme in the twenty-four hours. In complete starvation this gradual loss is probably not out of proportion to the general reduction of weight. Hence it does not lead to an actual lowering of the percentage of salt in the body. A diet sufficient in all other respects, but lacking salt, might bring to pass such a lowering.

One interesting result of using a salt-free diet has been observed in the failure of the glands of the stomach to produce hydrochloric acid. This valuable aid to digestion and antagonist of putrefaction must be evolved from the chlorides of the blood. Apparently it is not secreted when the concentration of these substances in the blood is at all below the normal, and this in spite of the fact that the chlorine ions of the gastric juice can probably be recovered quite successfully. The suggestion has been made that rigid restriction of salt should be beneficial in cases where the gastric acidity is excessive.

Bunge, an Austrian physiologist, has collected a great volume of data concerning the habits of different races as to the use of salt. It is evident that some people set a high value upon it, while others do not care for it at all. Where it is prized it has often figured in maxims and metaphors. "To earn one's salt" is a familiar phrase which gains point from the common origin of the words "salt" and "salary." Bunge learned that a certain East Indian tribe used as the most solemn oath in their court procedure the formula, "May I never taste salt again if I speak not the truth."

A little investigation shows that the desire to add salt to the food is experienced most by those who are vegetarians or nearly so. Men who are strictly carnivorous abhor salt. Thus it was found by the agents of the Russian Government that the natives of Kamchatka could not be prevailed upon to salt the fish which formed their entire diet. The supply of fish was uncertain and that which was saved to eat in the long intervals between catches decomposed in shallow pits. Still it was preferred to salt fish. We notice the same detestation of salt among carnivorous animals. They present a

marked contrast to many of the herbivora, like cattle, sheep, and deer, which are very fond of salt.

The Arctic explorer Stefanson has recently reported a striking instance of the objection to salt which accompanies the use of a flesh diet. The Esquimaux, whom he knows so well, have little vegetable food. When he settled among them he was embarrassed by their demands upon his hospitality. Policy dictated that he offer them food on all occasions, but there was every prospect that his stores would be rapidly depleted. The situation was relieved by a simple device. It was only necessary to salt the food moderately—merely to his own liking—to deter his visitors from making inroads upon it. The requirements of courtesy were satisfied and the provisions were conserved.

When a sample of food is burned as completely as possible the mineral constituents remain as ash. Chemical analysis of this ash leads to very different findings in the case of different foods. Several acids and bases will always be found. We will consider only the occurrence of sodium and potassium. The ratio between the quantities of these two bases is widely varied, though in the great majority of instances potassium is the more abundant. In animal foods the disparity is not marked, but in most vegetable substances it is striking. For example, the proportion of potassium to sodium in meat (veal) is 4 to 1, while in potato it is more than 3 to 1.

Can we recognize a causal connection between the excess of potassium in a vegetable diet and the craving for sodium chloride which is attendant on the use of such a diet? Bunge maintains that we can. His explanation has been criticised in detail, but is probably valid in its main thesis. The absorption into the blood of a quantity of salts, unlike those normally present there, imposes upon the kidneys the duty of restoring standard conditions. If the chief demand is for the removal of potassium compounds the task will soon be accomplished. But this will not be done without a considerable loss of sodium chloride. It would be remarkable indeed if the kidney cells could select all the foreign ions and not occasionally let slip some of the much more numerous native ones.

Bunge was able to demonstrate upon himself the fact that an excessive intake of potassium salts does lead to a loss of sodium chloride. He swallowed as much potassium phosphate and citrate as he could tolerate and subsequently excreted all the potassium—equivalent to 18 grammes K_2O—but simultaneously eliminated 6

grammes of sodium chloride. Such a draft upon the tissues could not be continued indefinitely unless salt were supplied in corresponding amount. Bunge's personal experiment was not an unreasonable one, for it is calculated that when potatoes form the bulk of a man's ration twice as much potassium may be ingested as in this trial.

There is, therefore, no doubt that salt is a necessary addition to diets in which the ratio of potassium to sodium is unusually high. The instinctive craving for it is a marvellous instance of the almost infallible correctness of such impulses. Bunge has recorded the use by an African tribe of the ash of a certain tree as a seasoning for their food. Most kinds of wood reduced to ashes would yield a mixture over-rich in potassium, which would be a most undesirable adjunct to other articles of vegetable origin. But the tree in favor with these people was the rare exception; its ash contained a most unusual proportion of sodium compounds. It is rather painful to fancy the tedious succession of experiments by which the ancestors of this tribe eliminated various kinds of wood, and pleasant to imagine the satisfaction realized when the fortunate choice was finally made.

BOOK REVIEWS.

CHEMISTRY OF FAMILIAR THINGS. By Samuel Schmucker Sadtler, S.B. Philadelphia and London: J. B. Lippincott Company. There are a great many persons who have not received any special training in the sciences but who are nevertheless interested in the results of scientific research, and for them a book which is readable and accurate is very welcome. There has always been a demand for popular books treating of chemistry, botany, biology, astronomy, etc. In view of the application of the studies of chemistry not only to the development of industrial processes but their importance to the life of mankind a book like the present one by Mr. Sadtler will be much appreciated.

In the first chapter we find enough elementary chemistry to enable the reader to understand and appreciate much of the information which follows in the subsequent chapters. Among the subjects discussed may be mentioned: Historical Development of Chemistry; The Periodic System of Elements; The Chemistry and Production of Light; Heat, Combustion and Insulation; Air, Oxidation and Ventilation; Water; Alkalies and Salts; Metals; Gold and Silver; Chem-

istry of the Earth's Evolution; Soil and Its Conservation; Food Elements and Food Classes; Individual Foods; Animal Feeding; Fermentation; Chemistry of the Body; Soaps, Solvents, and Paints; Paper and Textiles; Leather and Rubber; Silicious Substances and Glass; and A Few Important Definitions. The present volume contains a large amount of valuable information and will be appreciated by those who desire information on the chemistry of familiar things. It might also be advantageously placed in the hands of beginners, as it will be very stimulating to them in their studies. The work contains a large number of illustrations, many of which are drawn especially for this work by Miss Alice H. Sadtler. The paper, printing, and binding are excellent and the work should have a wide distribution.

LABORATORY MANUAL FOR THE DETECTION OF POISONS AND POWERFUL DRUGS. By Dr. Wilhelm Autenrieth, authorized translation of the completely revised fourth German edition by William H. Warren, Ph.D., with 25 illustrations. Philadelphia: P. Blakiston's Son and Co. Price, $2 net. This work is too well known to require an extended review. The present volume is considerably larger than the third edition and has been entirely revised. Among the new substances discussed the following may be mentioned: Cantharidin, cytisine, ergot, papaverine, pilocarpine, saponin substances, solanine, thebaine, and the toxalbumins, ricin, abrin, and crotin. In Chapter II hydrastine and veronal are elaborated. Chapter V has to do with special qualitative and quantitative methods, such as the quantitative estimation of phosphorus in phosphorated oils; the electrolytic detection and estimation of arsenic; the biological test for arsenic; the destruction of organic matter and detection of arsenic by A. Gautier and G. Lockemann; Karl Th. Mörner's estimation of minute quantities of arsenic; methods of estimating alkaloids by H. Matthes, H. Thoms, and A. H. Gordin. This chapter also includes A. J. J. Vandevelde's estimation of the toxic action of organic compounds by means of blood hæmolysis.

Chapter VI takes up the estimation of alkaloids and other active principles in raw materials (drugs) and in their preparations. Pharmacopœial as well as other estimations, such as that of nicotine in tobacco, caffeine in tea, coffee, kola preparations, etc., pilocarpine in jaborandi leaves, piperine in pepper, solanine in potatoes, and theobromine in cacao and its preparations, have been included. The

author has endeavored to treat these subjects as thoroughly as possible. Chapter VII describes the methods employed in detecting carbon monoxide in blood, in recognizing blood itself in stains, and in differentiating human from animal blood.

This work is of very great value to the practical chemist and will be of interest to pharmacists, as it contains a great amount of information on drug assaying, alkaloidal chemistry, and toxicological methods of procedure. The work has become of an international character, translations of the original German work having been made into English, Spanish, and Italian.

SQUIRE'S POCKET COMPANION TO THE BRITISH PHARMACOPŒIA, 1914, Second Edition. J. and A. Churchill, 7 Great Marlborough Street, London, W. Foolscap octavo, pp. 1040 (16mo.); measurement $6\frac{3}{4} \times 4\frac{1}{4} \times {}^{15}/_{16}$, weight 11½ oz. Price, 10s. 6d. net. The First Edition of Squire's Pocket Companion to the B. P. was published in 1904, and resulted from the necessity of dividing the older Squire's Companion to the British Pharmacopœia into two publications, owing to the very great increase in matter which had to be reviewed. The present, or Second Edition, follows the style of its predecessors, and is arranged in alphabetical order, thus obviating the necessity for frequent reference to the index, each monograph being subdivided into paragraphs, first a description of the drug with its usual method of preparation, solubility, medicinal properties, dose, prescribing notes, incompatibles, official preparations, not official preparations, and antidotes. This subdivision of the monographs is adopted for the purpose of making the book as convenient and practical a work of reference as possible for both prescriber and dispenser. A clear distinction in type enables the reader to distinguish at once whether a drug or preparation is official or not official, and this is further supplemented, except where the official preparation immediately follows the principal monograph, by a complete list of the official and not official preparations.

The subject of solubility has always been a feature of Squire's Companion, and dates back to the First Edition in 1864. For the present volume the figures have had to be carefully revised, and where a disparity exists between the official figures and those given in the Companion they have been carefully redetermined and, if necessary, modified. As an instance of the amount of work involved on these paragraphs alone, the change of the official ether from

Sp. Gr. 0.735 to 0.720 has necessitated the redetermination of the whole of the figures relating to solubility in this menstrua.

The medicinal properties have been entirely revised and brought thoroughly up to date by the inclusion of many references up to the end of the year, and no single important reference to an official or generally used unofficial substance has been omitted.

Doses are given in both the imperial and metric systems, and are those generally used by the medical profession. In the case of toxic drugs, reference is also made to the maximum single or maximum daily dose given in a continental pharmacopœia.

The prescribing notes, which perhaps are the most useful feature of Squire's Pocket Companion, as they appeal both to the prescriber and to the dispenser, have been systematically revised and considerably enlarged. Typical instances appear under Acidum Boricum, p. 22; Acidum Carbolicum, p. 28; Iodine, p. 478; Pituitary Gland, p. 637; Salvarsan, p. 734; Tinctures, p. 885. Many excellent methods of exhibiting drugs are embodied in these prescribing notes.

The paragraphs on incompatibles and antidotes have been brought into complete accordance with modern knowledge and requirements.

A chapter on therapeutical agents of microbial origin has been completely revised and almost entirely rewritten by Professor R. Tanner Hewlett, Professor of Bacteriology in the University of London, and includes up-to-date information on antitoxins, serums, tuberculins, vaccines, etc.

Immediately facing the first page of Materia Medica is a list of the important alterations in the new British Pharmacopœia, 1914, and each separate monograph is clearly distinguished by a bracketed sub-title, thus, [NEW], [MODIFIED], [ALTERED], etc. Typical monographs may be selected from the following examples: Acid Acetyl Salicylic, p. 10; Adrenalinum, p. 72; Chloral Formamidum, p. 257; Diamorphinæ Hydrochloridum, p. 324; Methyl Sulphonal, p. 545; Theobrominæ et Sodii Salicylas, p. 847; a typical example of a not official preparation appears under Pituitary Gland, p. 633.

Squire's Pocket Companion is a handsome volume, bound in red leather, with flexible covers, and gilt-lettered. It is printed on India paper from entirely new type. Notwithstanding that it contains some 274 pages more than the first edition, it is a considerably smaller-sized book. It gives the prescriber and dispenser a systematic and complete account of all the additions and alterations to the British Pharmacopœia, 1914, complete and up-to-date information

not only on all official but also on all important not official subjects, and an exhaustive review of over half a century's progress in therapeutics and pharmacy.

The adoption by the B. P. of the international atomic weights with $O = 16$ has necessitated the recalculation of the whole of the molecular equivalents throughout the book. An elaborate therapeutical classification of remedies, a list of remedies for special ailments, a list of the spas of Europe, classified as to their properties and temperature, are also included in the work.

It is easy to see that convenience of reference is studied well throughout the book, as even in the index a clear distinction in type enables the preparation to be classed as either B. P. or not B. P., the official name being printed in Roman, all the others in italics.

The book should be of considerable use to American pharmacists, as the preparations of the United States Pharmacopœia are compared with those of the British and also with the French Pharmacopœia.

MODERN MEDICINE AND ITS SOCIAL RESPONSIBILITIES.[1]

By Frederick R. Green, A.M., M.D.,

Secretary, Council on Health and Public Instruction of the American Medical Association.

When I received an invitation from your Program Committee to discuss this question before the Utah State Medical Association, I gladly accepted the opportunity. There is to-day serious need of an increased appreciation of the social responsibilities of the medical profession. As these are largely responsibilities of physicians in the aggregate than as individuals, it is important that they should be discussed in medical organizations and should become the basis of intelligent action. The unprecedented growth of our knowledge regarding disease and its prevention during the last forty years and the stimulus to scientific research which has come through the newer methods of investigation have so monopolized the attention of physicians that the greater part of our ability and energies has gone into the exploration of these new fields. Knowledge has increased

[1] Read before the Utah State Medical Association, Salt Lake City, Utah, September 30, 1914, and reprinted from *North West Medicine*, December, 1914, and January, 1915.

so rapidly that it has been difficult even for members of the medical profession to keep track of its advance. In most cases, individual physicians have only been able to master one particular field. So far as the people are concerned, they have been utterly unable to keep pace with the rapidly-growing knowledge of the profession and are consequently often unable to understand what physicians are trying to accomplish. Yet the most superficial survey of the field will convince any one not only that the social responsibilities of the medical profession are to-day greater than ever before, but also that never before has there been so wide a gap between technical scientific knowledge on the one hand and popular opinions on the other.

One of the paradoxes of the situation is that we have to-day a medical profession better educated, more competent, capable of doing more and desirous of doing more for the prevention of disease and the benefit of society than ever before, while the mass of people, although more intelligent and better informed on general subjects than their forefathers, are largely unaware of the benefits which they may derive from the application of the knowledge of modern medicine, and are hindering and delaying, by their indifference and at times by their open opposition, the application of knowledge in the hands of physicians which can be utilized in protecting the people from disease and in prolonging their lives. This anomalous condition has long been recognized. It has not, however, been as generally recognized as should have been the case, that such a condition must be due to definite causes, and that if sufficient study were given to it some solution must be found. As the will of the majority is the only compelling force recognized in our government, and as the support of public opinion is indispensable for the successful carrying out of any social measure, whether in the form of laws or customs, it is evident that the recognition of the causes underlying the present situation and the removal of any obstacles to the fullest coöperation and understanding between the medical profession and the public constitute a problem of the highest importance and worthy of the attention of the greatest minds in the profession.

For a clear understanding of any problem it is constantly necessary to revert to essential principles. Too often those who are participating in current events are unable to estimate correctly the relative value of different factors in the problem on account of their very nearness to and intimate participation in its phenomena. Accurate history cannot be written until years after the events which it describes. We are living to-day in a period of greater importance

to the future of civilization than the years of the Napoleonic wars. Yet we know far less about the movements of contending armies in Europe than we do of any of Napoleon's campaigns. Active participation in any campaign and personal advocacy of any measure are apt to develop personal prejudices and opinions, often based on insufficient evidence or biased statements, with which opinions we are often reluctant to part. It is only by reducing the problem to its simplest term, stripping off all non-essential and obscuring details and stating the questions involved in their fundamental form that we are able to divest our minds of personal and local prejudices and to recognize all the factors in the situation.

My subject carries with it by implication several questions which must be answered. These are: How does modern medicine differ from the medical knowledge of preceding generations, and how has this change altered the relations of society and physicians? What are the social responsibilities of modern medicine, and how do they differ from those of previous generations? What are the ideal relations which should exist between the medical profession and the public? What are the mutual duties and responsibilities of the two parties to each other? How can these responsibilities be made plain, both to physicians and to the people, and how can each party to the obligation be led to recognize and perform its plain duty?

If I were addressing a general audience I would consider it necessary at this point to discuss the change which has taken place in the last half century regarding our knowledge of epidemic diseases, and to show from history how plagues have afflicted mankind in all ages; how, in spite of advancing knowledge on all other subjects, they still continued to be truly pestilences which walked in darkness. No one knew whence they came, how they were caused or how they could be prevented, because their cause lay below the vision of man—in the microscopic world. Few realize the importance of the invention of the compound achromatic microscope in 1835, which first made it possible to study microscopic life. The work of many investigators in this field did not culminate until the middle of the last century, in the monumental work of Louis Pasteur, who first demonstrated the microscopic cause of diseases and devised an effective method for their prevention. His work, probably the greatest which any one man has ever done for humanity, finally led him to the epoch-making and immortal assertion: "It is possible for civilized man to cause all contagious diseases to disappear from the face of the earth."

These facts are well known to all physicians. They are not as well known nor their importance as well understood by the public as they should be. The work of Pasteur and his successors has entirely changed the relation of the State to public health. A danger which is visible to all and readily recognized needs only to be stated to be avoided. Dangers to life and health which the average normal man and woman can see require little, if any, legislation. The instinct of self-preservation is sufficient, if the danger is known. But in diseases caused by microörganisms the cause is not only invisible, but the specific cause can only be recognized by men of expert technical training, equipped with delicate instruments of scientific precision. The avoidance of such diseases clearly cannot be left to the individual. It therefore becomes the duty of society to do for the protection of the individual what he cannot do for himself, and to utilize scientific knowledge in protecting him from harm which he alone cannot avoid. The entire relation of the State to the people and of the medical profession to society and to organized government, whether of the city, the State, or the nation, has changed entirely during the last forty years through the development of our knowledge regarding the causes of disease. The moral and legal justification for State activity for the prevention of disease lies not in the demands of the medical profession, but in the fact that it is the duty of the State to protect its citizens against dangers from which they cannot safeguard themselves.

The justification for public education is the prevention of disease and the prolongation of life. Such objects need no argument. It is necessary, however, to convince the mass of the people of the possibility of their accomplishment.

When we look over the history of public health legislation during the last fifty years it is difficult to say whether surprise, indignation or amusement is most predominant. The misunderstandings, antagonisms and conflicting efforts on the part of physicians and the public might well be cause for amusement were the results of such misunderstanding not so serious. Prior to the middle of the last century there was practically no recognition of the responsibility of society and of the State in the prevention of disease. The State was in the same position as the medical profession: it had nothing to tell the people; it could only wait until a man or woman was stricken with disease and then care for them, if they were without other protectors. Late in the '60s growing conceptions regarding the duties of the State toward its citizens began to take definite form.

In 1869 Massachusetts established the first State Board of Health. California followed in 1870. At various periods since that time each State has created some kind of health organization. Some began as quarantine bodies, some as examining bodies, some as State boards of health *de novo*. The United States Public Health Service has recently issued an interesting summary of the history and general condition of our State health organizations. A careful reading of this study must impress every one with the amazing diversity of method and machinery as well as the large amount of waste effort required to secure the creation and perpetuation of these boards. Examination of the Proceedings of the Association from 1870 to 1877 will show that the principal force in their creation was the American Medical Association, and that the most important factor in securing the establishment of these boards, in maintaining them and in performing their functions was the medical profession. Now, the object of establishing these boards was and is to prevent unnecessary sickness, reduce the death-rate and make the people of the State healthier, happier, richer and longer lived. If there is any work which is more unselfish, self-sacrificing and clearly for the public good, history does not record it. Yet the principal difficulty during the forty-five years which have elapsed since Massachusetts passed her first law has been to convince enough of the people of any State of the desirability of such work to secure its establishment and development. Certainly when concerted and continuous effort is necessary to persuade people to allow themselves to be saved from sickness and suffering, and when the facts in the case are as readily demonstrable as the figures of the multiplication table, something must be seriously wrong with the manner in which this subject has been presented to make such a situation possible. When the history of the last forty-five years is reviewed, it is not difficult to see why the task has been a difficult one.

Following the development of modern bacteriology and pathology and recognition of the possibilities of State activity in preventing disease, efforts began to be made, as we have seen, to utilize the power of the State for the protection of the public. Now the average American has the utmost confidence in the power of legislation to accomplish almost any reform. Here was a field for legislation entirely for the public good, and yet the knowledge on which effective legislation could be based lay entirely outside the grasp of the average citizen. The specialist and the expert are not necessarily the wisest guides in legislative or public affairs. The expert is

usually the purely scientific type, engrossed in the problems of his particular field, positive as to his specific knowledge, but not necessarily broad in his conceptions or tolerant of the attitude of the average individual. He sees many wrongs which should be corrected, waste and loss of power which should be avoided and evils which should be eliminated, and, with his special knowledge and technical training, the way to secure these reforms seems clear and straight if only he could be allowed to enact and enforce the regulations which he knows would be effective. He is often impatient with the layman, who, lacking his training and expert knowledge, is unable to follow his reasoning or to understand his conclusions. The task of convincing a majority of average citizens by translating scientific facts into popular terms and placing the results of scientific research before the public in easily-understood form seems to the expert to be a hopeless task. How much easier it would be, he thinks, if only by the exercise of benevolent despotism a law could be passed decreeing that certain things should or should not be. So long as the object of such laws is the public good, the enthusiast concludes that any means are justifiable by which such legislation can be secured. This has been the line of reasoning which has too often been followed in planning public health legislation. When it is recalled that the forty years which cover the development of our present-day knowledge of preventive diseases coincide almost exactly with the period of special influences and class legislation in most of our legislative bodies, it is not strange that the medical and sanitary expert has too often fallen into the ways of the professional politician. The further and graver errors of mistaking legislative enactment for constructive progress, of thinking that the passage of a law marked a real achievement, whether the law was supported by public opinion or drafted so as to be enforcible or not, and that the end to be gained in a campaign for sanitary legislation was to "put over" the intended bill, and that something was accomplished when this was done, have also been far too prevalent. When to this situation is added the fact that the rapid growth of any special line of knowledge favors the development of those who mistake a working hypothesis for a proven fact, or who allow their interest in a special but comparatively unimportant topic to lead them to regard it as one of paramount importance, it is not strange that the extremist and the hobby-rider have too often exercised an undue influence in public health legislation.

The greatest single mistake has been the belief, common in the medical profession for the last forty years, that sanitary reforms could be accomplished by the passage of laws. This is all the stranger in view of the fact that a clear and definite note of warning was struck early in this period by one of the leaders of medical thought of his day. In 1877, at the Chicago session of the American Medical Association, Dr. Stanford E. Chaille, of New Orleans, presented a paper on "State Medicine and State Medical Societies," which to the student of the development of State medicine in this country must ever remain as one of the clearest and most far-sighted papers ever presented before the association. Discussing the necessity of systematic education of public opinion as a necessary precedent to the enforcement of sanitary laws, Dr. Chaille says:

"It requires no great wisdom to enact laws, but great wisdom to enact on many subjects laws which can be enforced. The history of legislation is glutted with the enactment of laws which not only failed to accomplish the object intended, but which did accomplish a very different one, often bringing the object sought for into public contempt. Rarely do writers on State medicine realize the truth of the lessons taught by students of the philosophy of lawmaking, that there is a class of subjects in regard to which laws can be enacted in advance of public opinion without fear of bad results; but that there is another class of subjects in regard to which no laws can successfully precede their public sanction, and, if enacted, violation and contempt for them will ensue. Unfortunately, to this class belong such subjects as the regulation of the practice of medicine, compulsory vaccination, registration of vital statistics, etc., and their satisfactory disposal cannot be hoped for until an enlightened and organized medical profession exercises its influence on public opinion."

In spite of this clear statement of the problem, we have, as a profession, placed far too much confidence in legislative enactment as a means of social and sanitary improvement. This is partially due to the prevailing popular idea that the passage of a law in some way accomplishes something, and that a law necessarily contains within itself the power for its own enforcement. A law is not a force and never can be. A law is simply a rule of action, a statement of the way in which a force acts or should act. Now in this country the only possible force is public opinion, the will of the majority. It has come to be recognized as axiomatic that no law

which is not approved by a majority of the people can be enforced. As Dr. Chaille has clearly stated, the important thing is to convince the people and to mould public opinion. As soon as this is done, necessary laws will follow as a natural consequence. But with a convinced and aroused public only a minimum amount of legislation is necessary. Public opinion can accomplish as much as, if not more than, legislation in some lines, leaving to the law-making powers only the necessity of enacting, and to the administrative officials the necessity of enforcing, so much legislation as may be necessary to make public opinion effective.

But there is another and more serious consequence of the enactment of public health laws without the support of public opinion. Not only are laws so obtained generally ineffective, but their passage encourages the feeling on the part of the public that health legislation is a matter which is in the hands of physicians, and that the people have no responsibility on this subject. It is an axiom in physiology that an unused function always undergoes atrophy. The more physicians relieve the people of the responsibility for securing proper health laws, the greater will be the difficulty in making them realize that they have any responsibility. We have, through shortsightedness in the operation of free clinics in our large cities, pauperized a large proportion of the people. Let us beware lest we pauperize them mentally by relieving them of the responsibility of protecting themselves from disease.

Not only has the growth of knowledge altered the relations of the State and the individual, but it has no less radically altered the professional relations between physicians and patients. The responsibility of the physician was formerly limited to the individual patient. This is no longer the case. The present-day physician wants to know not only what is ailing his patient, but also how his patient acquired the disease, whether any other persons are exposed to contagion from the same source, whether the patient himself is a danger to his friends and relatives, and whether the disease will spread throughout the entire community or can be confined to the single case in hand. He owes a responsibility not only to his patient, but to the community. He is not only the caretaker and medical adviser of the sick; he is also the guardian and protector of the well. Each practising physician is or should be a sanitary policeman for the protection of the community against contagion. In a few cases, notably State boards of health and a few of our larger cities, men

especially expert devote all of their energy to sanitary police work as public health officers, but this does not and cannot take the place of the constant vigilance and coöperation of the mass of the medical profession. Yet because in previous generations the relations of a physician and his patient were entirely personal, and because compensation was based on these personal relations, the public health police work of the medical profession, done for the sake of the community, is largely unrecognized and entirely uncompensated. In other words, physicians as a class have recognized their duty to the community before the community has recognized its duty to physicians. Careful reflection will, I think, sustain the conclusion that in this situation is found an explanation of many of the economic difficulties of the medical profession at present. That it is a transitory condition and one which will be remedied in the future admits of little doubt.

(*To be continued.*)

PHILADELPHIA COLLEGE OF PHARMACY.

Annual Meeting.

The annual meeting of the Philadelphia College of Pharmacy was held March 29, 1915, at 4 P.M., in the Library; the President, Howard B. French, presiding. Twenty members were present.

The minutes of the quarterly meeting held December 28, 1914, were read and approved. The minutes of the Board of Trustees for December, 1914; January and February, 1915, were read by the Registrar, J. S. Beetem, and approved.

President French then delivered his Annual Address, containing a summary of matters of general interest that have occurred in the institution during the past year. Upon motion of George M. Beringer, it was ordered that the address be entered on the minutes, a mimeographic copy be sent to every member of the College, and an abstract be published in the American Journal of Pharmacy (see p. 238).

Report of the Committee on Publication.—In the abscence of the Chairman, Professor S. P. Sadtler, the report was read by Mr. John K. Thum. "In spite of the financial depression during the past year we can make a most gratifying showing for the year. The receipts from advertising, subscriptions, and sales of back numbers exceed all previous records. The financial statement accompanying

the report is for the year ending March 17, 1915, all bills for the year having been paid."

EDITOR'S REPORT was read by Professor Henry Kraemer. "The subject of the growing of medicinal plants is of growing and practical interest, and during the past few years much original matter on this subject has been published. This interest is reflected in the demand for back numbers. The European war has caused some delay and loss in our foreign subscribers receiving their Journal. It is hoped that this will soon be remedied. The twelve issues during the year comprised a total of 568 pages and a complete index of 10 pages. The articles have been up to our usual standards, and we are indebted to a number of our members for their literary and scientific contributions. Mr. Wilbert has continued to send us his quarterly reports on the 'Progress of Pharmacy.'"

REPORT OF COMMITTEE ON PHARMACEUTICAL MEETINGS was read by Professor Henry Kraemer, in which he referred to the work accomplished during the past year and suggested that the by-laws relating to this committee be changed.

CURATOR'S REPORT.—In the absence of the Curator, Mr. Joseph W. England, on account of illness, the report was read by the Secretary. "The Museum is in good condition; a rearrangement of some of the cases and hanging of pictures, etc., on the walls has had a very pleasing effect. The Curator suggests changing the desk and platform to the south end of the Museum, as being much better for the holding of meetings and lessening the confusion of persons coming in during addresses and business. Suggestion is made that each one of the departments be given space in the cases to exhibit specimens of apparatus, etc., especially of an historical character. More shelf room could be secured in the Museum by replacing the larger containers with smaller ones." The suggestions of the Curator were, on motion, referred to the Committee on Property.

REPORT OF THE LIBRARIAN was read by the Librarian, Miss Katharine E. Nagle. "During the past year the accessioning, classification, and shelf-listing have been completed. There have been accessioned 1492 books, making a total of 8756 books ready for cataloguing. There have been received from the United States Government reports of the Census, Treasury, Library of Congress, Smithsonian Institution, Public Health, Commission of Labor, Daily Consular Trade, and Bulletins and Circulars from Department of Agriculture,

Digest of Comments on the U. S. Pharmacopœia, and 70 volumes of miscellaneous reports from other sources."

Information was asked as to the number of volumes stored in boxes, in addition to the volumes in cases. Answer was made that there were several thousand, making a total of about 20,000 volumes now in the Library.

The report of the Committee on Nominations was received and ordered entered and filed.

ELECTIONS OF OFFICERS, COMMITTEE, AND TRUSTEES.—The President appointed C. Stanley French, Mitchell Bernstein, and E. F. Cook tellers to conduct the election. While the ballots were being counted the President announced the following appointments:

Committee on By Laws: George M. Beringer, Joseph W. England, and C. A. Weidemann.

Delegates to Pennsylvania Pharmaceutical Association: C. B. Lowe, Joseph P. Remington, F. X. Moerk, F. P. Stroup, Charles H. LaWall, E. F. Cook, and O. W. Osterlund.

Delegates to New Jersey Pharmaceutical Association: Henry Kraemer, George M. Beringer, C. B. Lowe, Charles H. LaWall, H. P. Thorn, and John W. Hayes.

Delegates to Delaware Pharmaceutical Association: A. W. Miller, C. B. Lowe, H. J. Watson, and S. Loraine Foster.

Dr. A. W. Miller, for the Special Committee on Relief for Belgian and Other Pharmacists, reported that a circular letter had been sent to every member of the College soliciting contributions, and that a number of responses had been received.

The following contributions have been acknowledged: Warren H. Poley, L. Gerhard, Adolph Miller, Henry P. Thorn, John E. Carter, George B. Evans, Aubrey Weightman, Henry Kraemer, Frank G. Ryan, Harry Matusow, Howard B. French, George M. Beringer, Alfred Mellor, L. E. Sayre, Richard M. Shoemaker, E. G. Eberle, Charles E. Sniteman, F. F. Muller. and John F. Hancock.

Dr. R. V. Mattison offered the following resolution: "*Resolved*, That this meeting, in its annual assemblage, heartily endorses and upholds the position taken by our President, as announced in his Annual Address, in regard to the desirability of maintaining the present high standard of education as set forth by our curriculum." After remarks by several of the members the resolution was unanimously approved.

A paper submitted by Mr. Joseph W. England,. entitled, "An

Historic Store," accompanied with a photograph of the place of business of Bullock and Crenshaw, northeast corner of Sixth and Arch Streets, was received, and on motion the thanks of the College were tendered the donor.

The tellers, having concluded their count, reported the election of: President, Howard B. French; first vice-president, R. V. Mattison, M.D.; second vice-president, Joseph L. Lemberger; treasurer, Richard M. Shoemaker; corresponding secretary, A. W. Miller, M.D.; recording secretary, C. A. Weidemann, M.D.; curator, Joseph W. England; editor, Henry Kraemer; and librarian, Katharine E. Nagle.

Trustees for three years: Walter A. Rumsey, Jacob M. Baer, and Warren H. Poley.

Publication Committee: Samuel P. Sadtler, Henry Kraemer, Joseph W. England, Joseph P. Remington, Martin I. Wilbert, Charles H. LaWall, and George M. Beringer.

Committee on Pharmaceutical Meetings: Henry Kraemer, Joseph P. Remington, C. B. Lowe, M.D., George B. Weidemann, and E. H. Hessler.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

ABSTRACT OF ADDRESS OF THE PRESIDENT.

Following the practice which was established some years ago, your President will submit a brief summary of matters of general interest that have occurred in your institution during the past year.

Your property is in fairly good condition, and it has not been necessary, during the past year, to make any extensive improvements. The minor repairs have been sufficient to keep your buildings in proper condition and up to their usual standard.

Your President regrets that he cannot report an increased number of students over the previous year, the total number in attendance being 431, against 434 during the previous year. Special chemistry students number 37. Food and drug course has 4 students. Special course in bacteriology comprises 22 students; of this number 16 are regular pharmacy students, 4 are graduates, and 2 new matriculants. Five students attend the special course in microscopy, and all are special chemistry students.

Your President desires to bring to your attention the increased number of students doing special work in the Laboratory. Last year there were 13 first-year students, this year 27 first-year students; last year there were 28 second-year students, this year 51 second-year students, and 35 third-year students last year and 25 this year, making a total increase of 27 students this year doing special chemical work.

The requiring of recording the attendance of students has been continued during the present session and shows a satisfactory improvement upon the part of the students.

Work in the Chemical Department has been conducted in a most satisfactory manner. Your professor of chemistry has had delivered to the students several very completely illustrated lectures on chemical industries, in which both materials of the industry and the actual working steps were interestingly presented by the aid of moving-picture reels, thus making it possible for the class to understand the progress of manufacture and the working out of details from the crude to the finished product; in other words, giving them what might be termed a practical illustration of commercial production. It is of interest to know that two more illustrated lectures will be delivered before the close of the session.

Your Department of Pharmacy reports a marked improvement in the attention of students, and that the average scholarship is higher and better than that of the two previous years.

Extra lectures on pharmaceutical subjects have been delivered and have proved of great value to the large number of students attending.

In operative pharmacy there has been a marked increase in the number of hours devoted to instruction, and a close system was followed for checking the work done by the students. Special attention has been given to instructing the student as to the desirability of profitably manufacturing preparations under his own brand, so as to establish a reputation among his customers and well-merited commendation from the practising physicians, as well as increasing his financial success.

The course of commercial training has been successfully prosecuted during the past year, and many additions have been made, thus improving the department. It is now expected that during the coming session of the College this course will be increased so as to include instruction in salesmanship.

The Department of Botany and Pharmacognosy has been most

active during the past year and has brought the College prominently before the public, causing numerous inquiries to be made of the departments for information regarding the experiments they have made in the cultivation of medicinal plants. It is commendable that the department, with an inadequate space furnished by only a moderate roof garden and a small green-house, has been able, through its experiments, to attract so much attention as to induce upwards of a hundred inquiries to be made concerning its success in growing medicinal plants. In addition to the inquiries, it has had a number of visitors, including teachers accompanied by pupils, from some of the higher educational schools of the city, who showed much interest in the work being done by your Department of Botany and Pharmacognosy.

It is truly unfortunate that the Philadelphia College of Pharmacy is not in a position to furnish greater space in the shape of an adequate garden for use of this department. It has been hoped that the Park Commission would deem it desirable to set aside, under the direction of your College, a space of ground to be used as a botanical garden to instruct not only the students of your own College, but those of other advanced institutions of Philadelphia and, in fact, of the State of Pennsylvania, on the value of growing medicinal plants.

Some institutions in other States have large appropriations made them to develop and advance the study of botany and pharmacognosy, and we can but regret that this College has not been placed in a position where it could be of still greater service in assisting students to study this most interesting branch of science.

Since your last annual meeting the Clayton French Fellowship has been established and a tablet has been erected in the hall of your College, bearing the following inscription:

1824 1890

Clayton French

FELLOWSHIP

Established by his daughter

Mary I. Banks

May 16th, 1914.

The Honorary Roll Tablet, which has also been placed in the hall since your last annual meeting, contains three class years, viz., 1889, 1914, and 1904, each having contributed the required amount

towards the Centennial Fund, thus warranting its class year being placed upon the tablet.

There have been elected to the membership of your College, during the past year, 2 active members but no associate members. It is with regret that we have to record, during the same period, the death of 8 active members, as follows:

Peter T. Fox, April 24, 1914; joined the college, 1872. George J. Scattergood, July 16, 1914; joined the College, 1859. William E. Lee, July 20, 1914; joined the College, 1907. Henry C. Eddy, August 29, 1914; joined the College, 1869. William H. Lacey, September 30, 1914; joined the College, 1886. Charles L. Eberle, October 4, 1914; joined the College, 1867. Edward H. Hance, December 14, 1914; joined the College, 1857. Charles G. Dodson, March 17, 1915; joined the College, 1891; and 1 associate member, John F. McGovern, March 1, 1915; joined the College, 1908. This leaves 141 active members and 12 associate members. It may be of interest for you to know that one of your active members, Edward H. Hance, had been associated with the College since 1857, a period of 57 years; another, George J. Scattergood, had been a member since 1859, a period of 55 years; another, Charles L. Eberle, since 1867, a period of 47 years, and another, Henry C. Eddy, had been a member since 1869, a period of 45 years.

In 1821 your College was organized at a meeting held in the historical Carpenter's Hall, of this city. It has grown from that very small beginning to the largest and most influential institution of its kind in the United States, if not in the world. It has from its inception increased in importance as an educational centre, and it is believed that its curriculum to-day is unequalled by any similar institution. And, while it has passed its 94th birthday, it is filled with the vigor of youth and can be referred to as ninety-four years young, instead of ninety-four years old.

Its aggressive and progressive methods have been objected to by the educational department of one of the larger States, which has urged that the high standard maintained by your institution be lessened and your term of tuition be changed from a three to a two years' course, so as to do away with the Doctor of Pharmacy Degree and return to a Pharmaceutical Graduate Degree. It has seen fit to accredit your institution with but one year, thus necessitating a graduate of the Philadelphia College of Pharmacy to take another year's course in a college giving but two years' instruction. Upon refusal

to comply with this requirement or penalty—as it may properly be termed—a student leaving your institution for that State, although in many, if not in most, cases qualified to teach in any one of its schools of pharmacy, must submit, as stated above, to being penalized for graduating from the oldest and, your President thinks, the best College of Pharmacy in the United States. Your President earnestly hopes that the membership of your College will stand strongly together, firmly bound, with the intention of maintaining her present high standard.

It would be a source of great regret to your President to see the curriculum of your institution changed to lessen the present high standard that is maintained, and he desires to express the hope that not only the membership of your College, but that the men in whose hands is entrusted the management of its affairs, will not be found wanting in courage to enable them to stand up and fight for what they believe to be right, even though it may be against great odds; and he ventures to express the hope that their consciousness of having done what they believe to be for the best interests of the institution in maintaining its present high standard and leadership in the pharmaceutical world will be sufficient recompense for the anxiety and labor which they have and will be forced to bear.

But six more years remain until your centenary anniversary occurs, and it is to be hoped that every effort will be made towards securing for this grand old institution a new home, with proper and commodious buildings and grounds surrounding same to enable it to continue the noble work it has been doing in the past.

To those of the officers and faculty who have coöperated, with much self-sacrifice, with your President during the past year he wishes to extend his appreciation and to express the hope that those who have not been in accord with his views may at least credit him with doing what he believed to be for the best interests of the institution. He has no personal ambition to serve—his sole compensation being the hope that the College may continue to prosper, whether he continues as your chief executive or not, and that from the present date until the centenary has been reached hearty cooperation and united action may be the sole purpose and inspiration of all those connected with the College, officially or otherwise.

Respectfully submitted,

HOWARD B. FRENCH.

March 22, 1915.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

December 1st, 1914.—Sixteen members present.

Committee on Scholarships reported that an additional Dobbins Scholarship was available, and recommended a candidate to whom the award should be made, which was agreed to.

Committee on Accounts and Audit recommended that the usual honorarium be given the Editor and Business Manager of the Bulletin for services rendered during the past year. It was agreed to do so.

Committee on Athletics reported favorably concerning the petition of the women students to establish a basket-ball team. This was approved.

Mr. French read a communication from the Secretary of the Centenary Celebration relative to class inscription on the Honor Tablet. The Dean moved that the arrangement of the tablets on the walls of the College and the lettering thereon be in charge of the Property Committee, and that when a class had paid the necessary amount the Treasurer should notify the committee. It was so ordered.

A communication was read from the Secretary of the Pennsylvania State Pharmaceutical Board relative to the necessity of all first-year students applying for a State preliminary certificate. The Dean said he had read the communication to the class and impressed its importance upon them.

January 5th, 1915.—Fifteen members present.

Mr. Poley read the following resolution which had been offered at a previous meeting:

"WHEREAS, Many benefactors of the Philadelphia College of Pharmacy or of pharmacy in general are deemed by their surviving associates worthy of some permanent memorial, so that the inspiration of their deeds and life may be kept before the students and members of this College in perpetuity; therefore, be it

"*Resolved*, The Philadelphia College of Pharmacy will maintain and display a Memorial Tablet, constructed and erected by the donors in honor of any person whose life in the drug or allied business or whose services to this institution may be deemed by the Board of Trustees worthy of such recognition. Material, design, and inscription of proposed memorial shall be approved by the Board of Trustees, and location assigned by the Property Committee of said

Board. In order to maintain and care for said tablet, a sum of at least five hundred dollars shall be paid to the College."

After some discussion the Preamble and Resolution was adopted.

Committee on Examinations reported the names of four persons for the degree of Master in Pharmacy, when the Dean moved to amend to add one other name, which was agreed to, and, in accordance with the By-Laws, these names were referred to a special committee for further consideration. The committee further recommended a change in Article 8, Section 3 of the By-Laws, which, according to rules, was held over for one month.

The Chairman read a communication from Mr. French recommending, first, that the title of our solicitors be corrected to Gill and Linn, and that Edgar S. McKaig, Esq., be appointed an additional solicitor. This was agreed to.

The Secretary read a communication from the St. Louis College of Pharmacy appreciating the sending of a representative to the celebration of their fiftieth anniversary.

February 2nd, 1915.—Fourteen members present.

Committee on Instruction recommended R. B. Brown, third-year student, as assistant in Department of Operative Pharmacy, and same was approved.

Committee on Examinations presented a communication from Professor Kraemer giving the names of those students who had taken the course in bacteriology during the session from 1909 to 1913 and satisfactorily passed their examinations and were, by a recent ruling of the Board, entitled to a certificate, which motion was ordered.

The committee reported the name of Archibald Wolever as having complied with all the requirements of the College and satisfactorily passed his examinations, recommending him for the Certificate of Proficiency in Chemistry. Agreed to.

The special committee to whom were referred the names of those proposed for the degree of Master in Pharmacy—Honoris Causa—reported unanimously in favor of the recommendation of the Committee on Examinations. A ballot was taken and the Chair declared the five persons named elected to receive the degree of Master of Pharmacy at the next commencement.

A communication from Edgar S. McKaig was read, in which he acknowledged receipt of notice of his election as solicitor, and stated that he appreciated the honor thus conferred and would have pleasure in serving the College to the best of his ability.